Armed Forces College of Medicine

AFCM

Prof. Dr. George F.B. Hanna

Development of GIT 1

Prof. Dr. George F.B. Hanna

Ass. Professor of Anatomy

.M.B.B.Ch., M.Sc., Ph.D., M.D

(.New York, U.S.A)

INTENDED LEARNING OBJECTIVES (ILO)

By the end of this lecture the student will be able to:

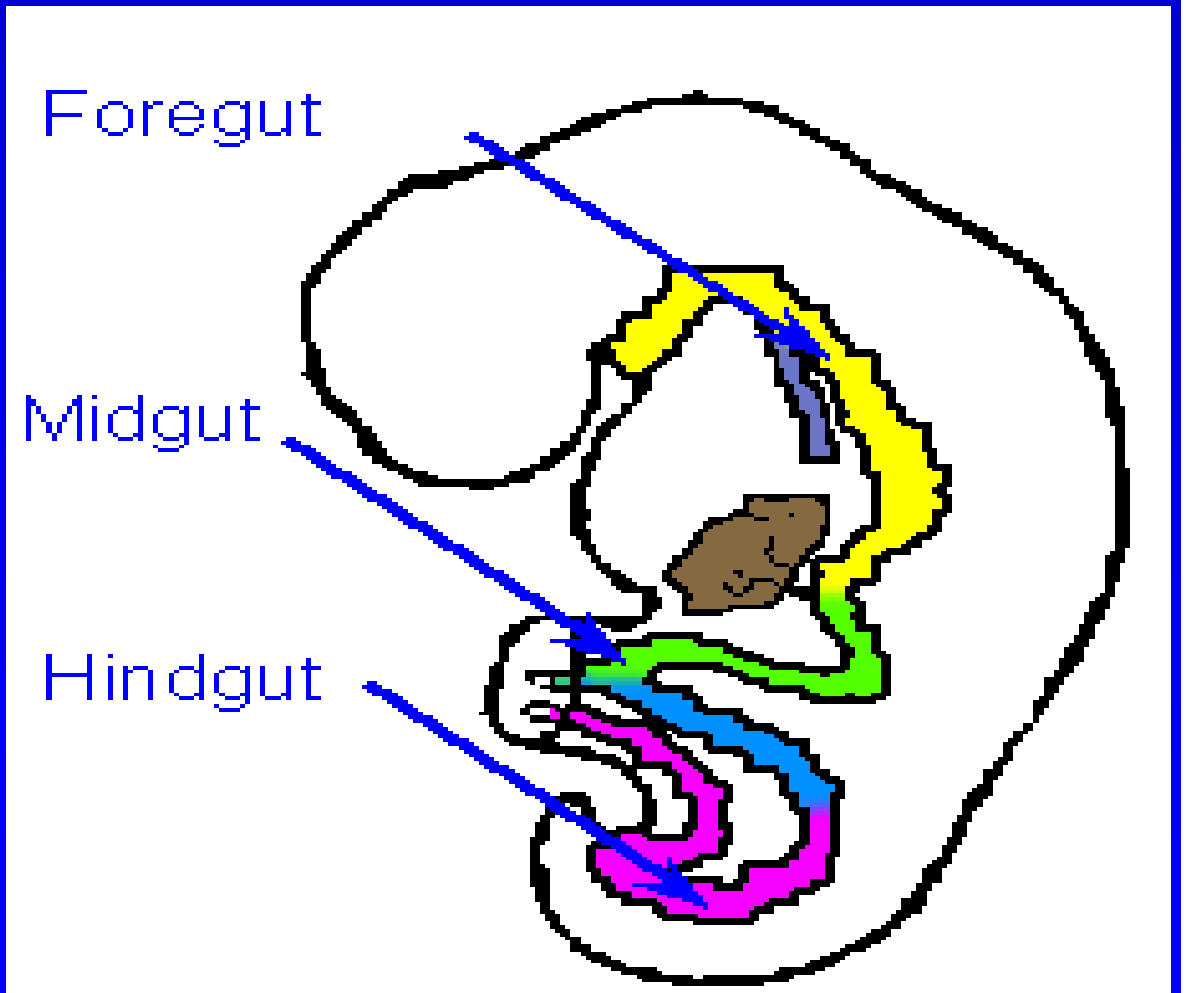
1. List the sources & steps of development of stomach & duodenum.
2. Define the development of peritoneal folds of stomach & duodenum.
3. Explain the congenital anomalies of

Lecture Plan

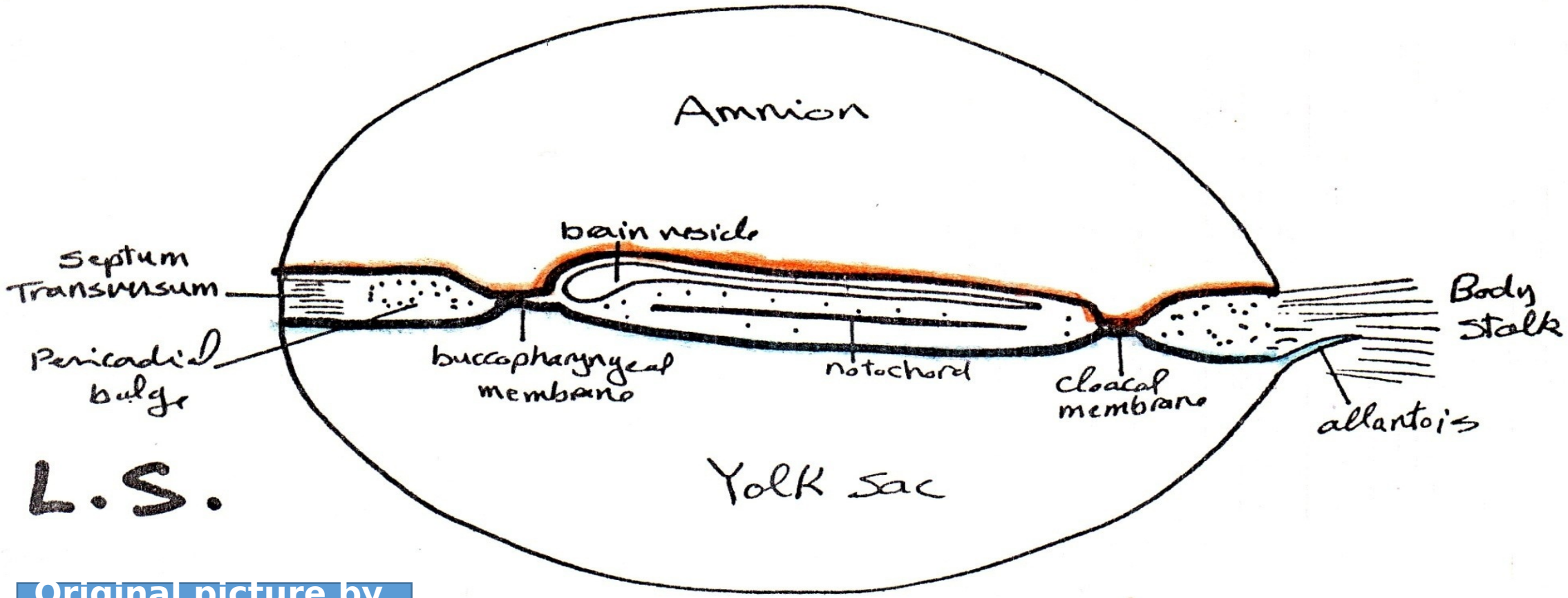
1. Part 1 (10 min) Introduction to the gut tube
2. Part 2 (20 min) Development of stomach
3. Part 3 (20 min) Anomalies of stomach & Development of duodenum
4. Summary (5 min)

Development of the Gut

- By the end of the 6th week



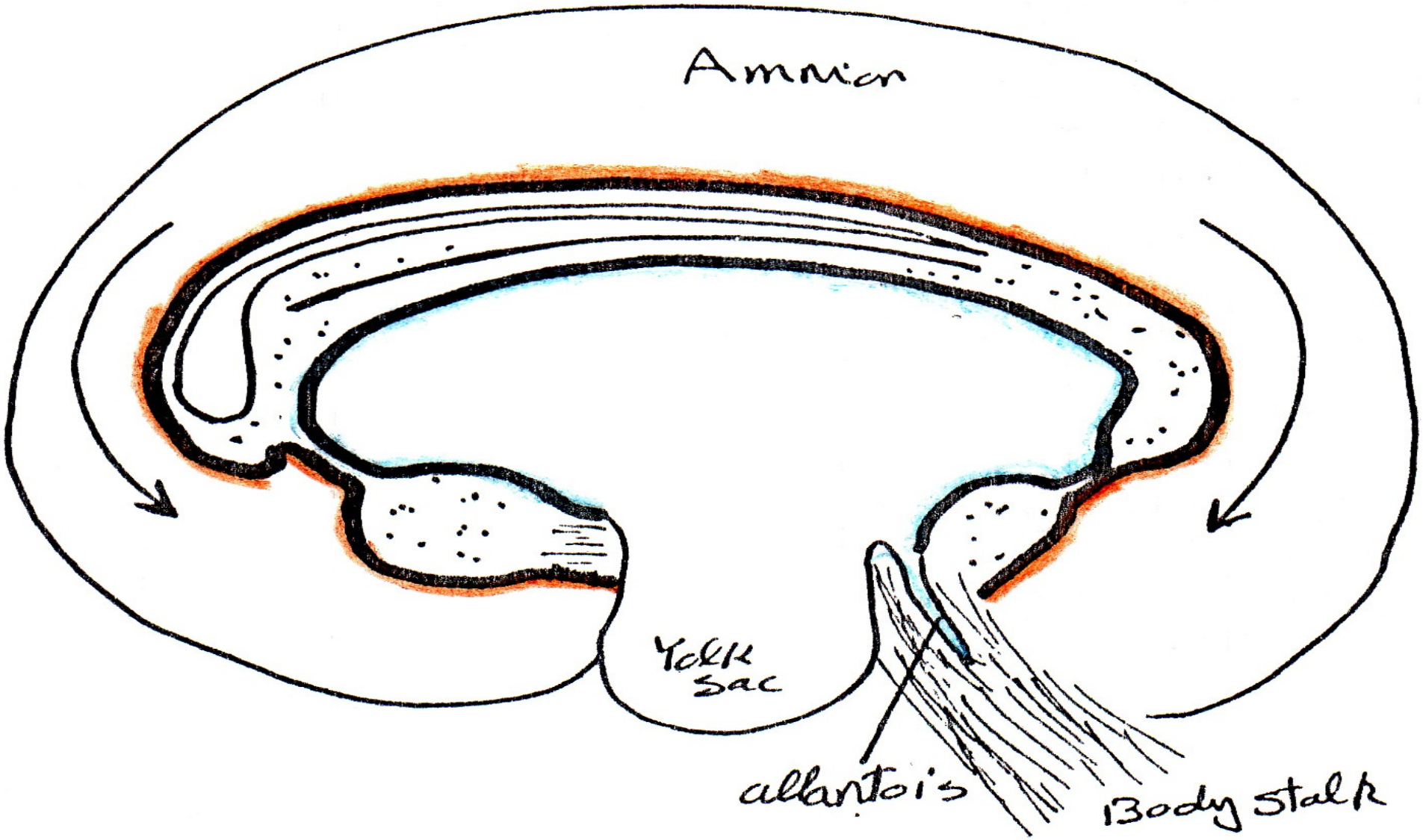
Foregut, Midgut and Hindgut develop during head, tail & lateral body folding.



Folding (1)

Original picture by Prof. Dr. George F.B. Hanna

Prof. Dr. George F.B. Hanna



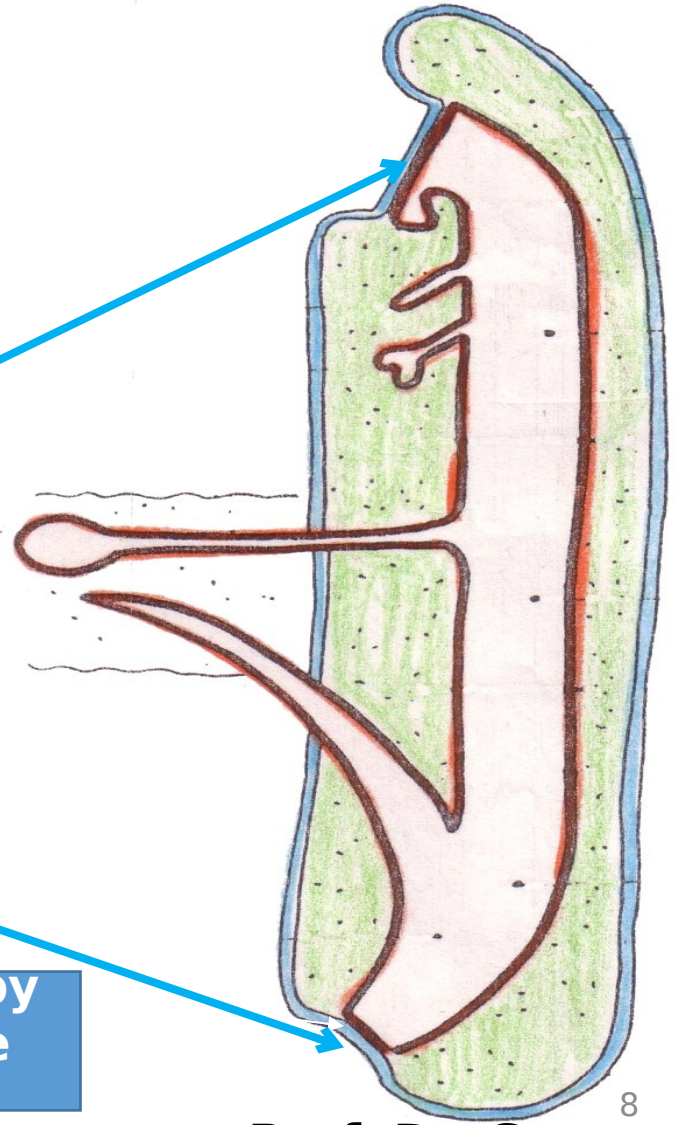
Original picture by Prof. Dr. George F.B. Hanna

Folding (2)

Prof. Dr. George F.B. Hanna

I. The primitive gut tube

- As a result of folding, the endoderm is enclosed inside the fetus lining the gut tube.
- The upper end of the gut tube is closed by Bucco-pharyngeal membrane.
- The lower end of the gut tube is closed by the cloacal membrane.



Original picture by Prof. Dr. George F.B. Hanna

Prof. Dr. George F.B.

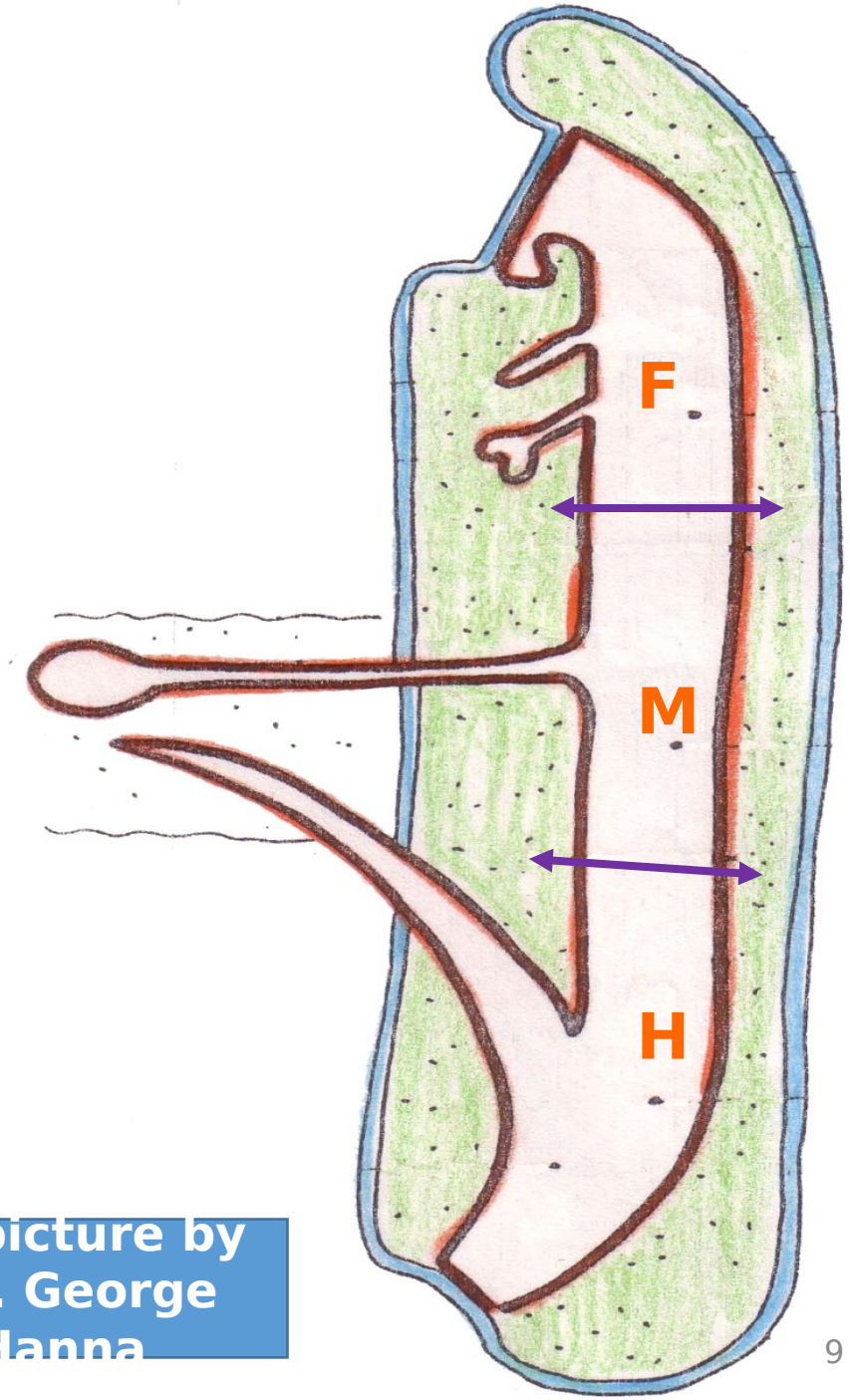
- **The gut tube is formed of :**

a. Foregut (towards the head region).

b. Midgut (in the middle part of the fetus).

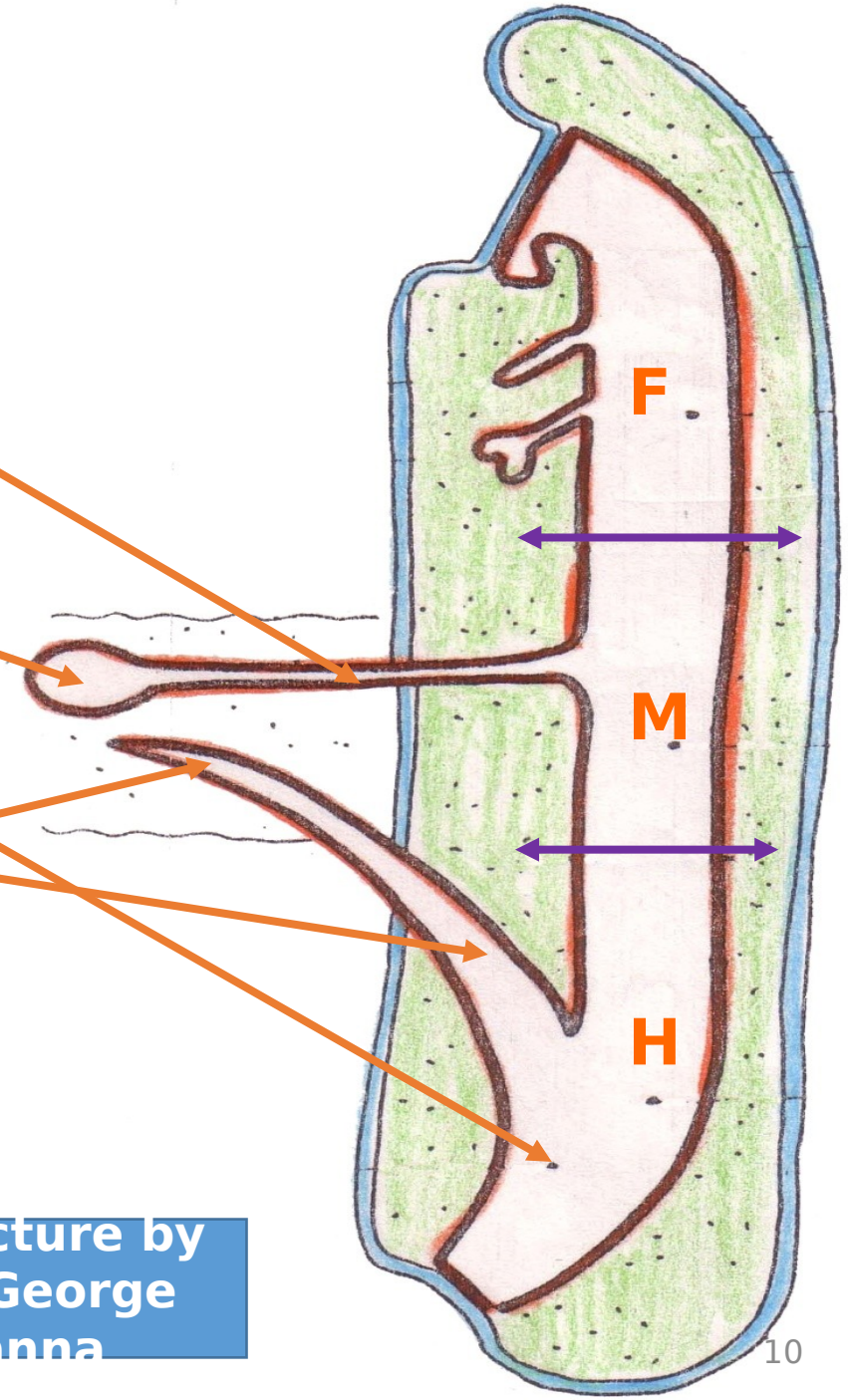
c. Hindgut (towards the tail region).

- **The 3 parts of the gut tube are separated from each other by ant**



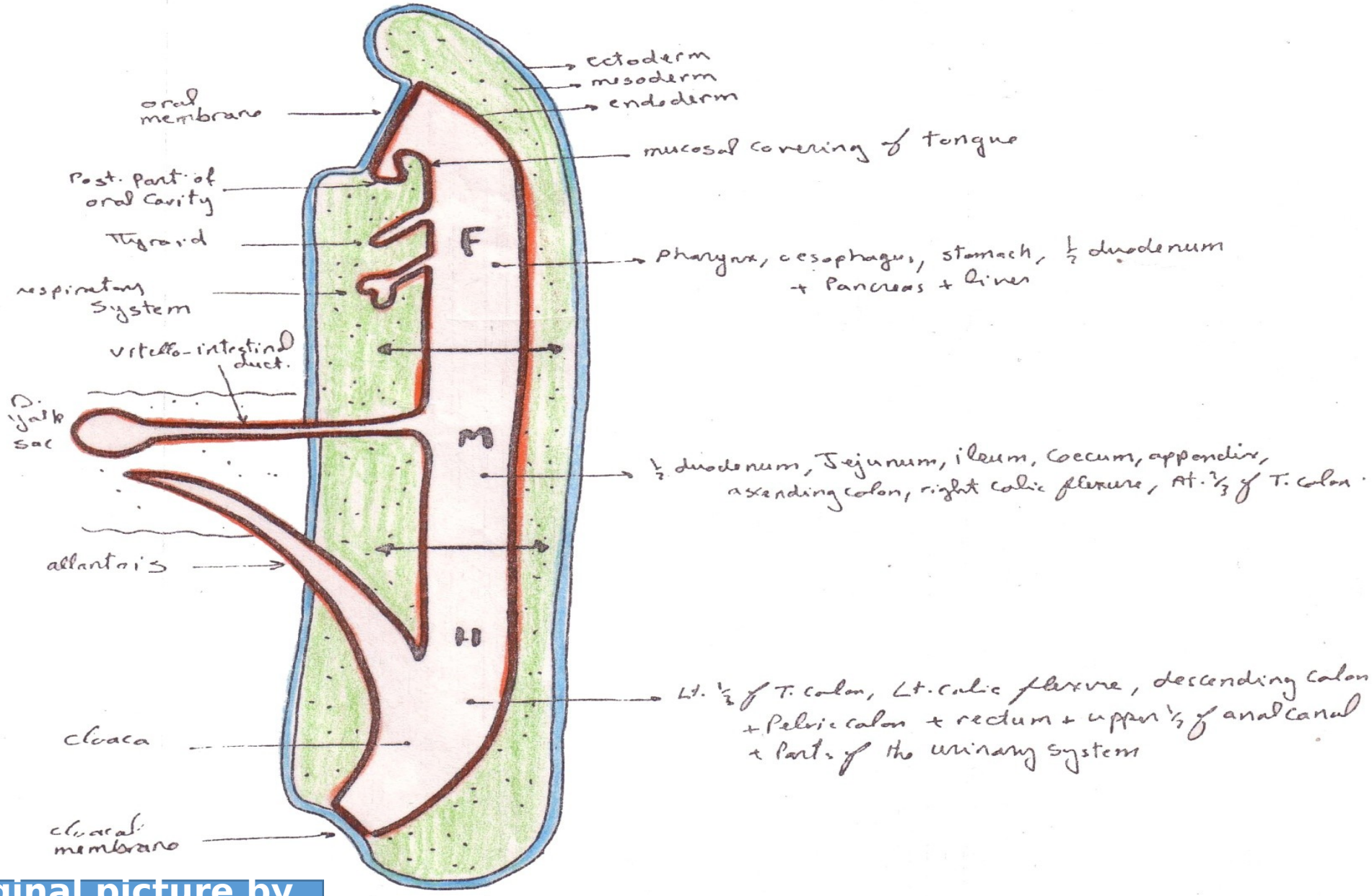
Original picture by Prof. Dr. George F.B. Hanna

- **The midgut is the connected via the vitello-intestinal duct to the definitive yolk sac (in the umbilical cord)**
- **The distal part of the hindgut is dilated & called Cloaca.**
- **The cloaca sends a forward projection called Allantois, the distal blind end of which (reaching the umbilical cord) is called Urachus.**



Original picture by Prof. Dr. George F.B. Hanna

REVISION



Original picture by Prof. Dr. George F.B. Hanna

Prof. Dr. George F.B. Hanna

II. Derivatives of the gut tube

- **GIT from pharynx till upper ½ of anal canal:**
  - **a. Ant. intestinal portal (junction bet. foregut & midgut) lies in the major duodenal papilla in the middle of 2nd part of duodenum.**
  - **b. Post. intestinal portal (junction bet. midgut & hindgut) lies at the junction bet. Rt 2/3 & Lt. 1/3 of the transverse colon.**
- **Post. part of mouth cavity.**
- **3 derivatives from floor of pharynx (3 Ts.):**
  - **a. Tongue.**
  - **b. Thyroid gland.**
  - **c. Tracheo-bronchial tree (Respiratory system).**
- **Pancreas.**
- **Liver & biliary system.**
- **Spleen.**

Prof. Dr. George F.B. Hanna

III. The abdominal part of the gut

- **After elongation, it is now formed of:**

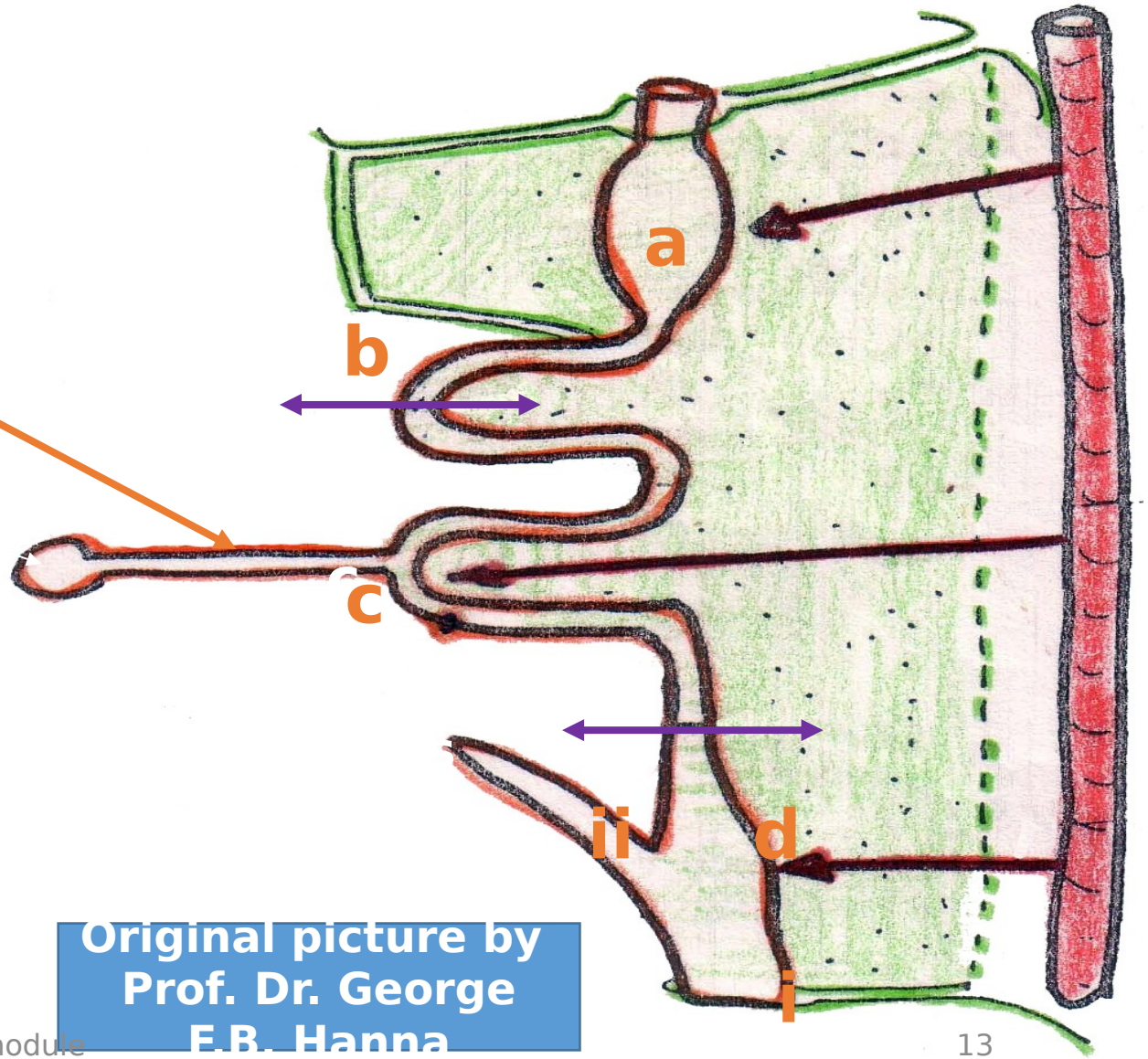
  a. Proximal fusiform dilatation (= future stomach).

  b. Duodenal loop (convex ant.).

  c. Midgut loop (also convex ant., with the vitello-intestinal duct in its middle connecting it to the definitive yolk sac).

  d. Hindgut with the cloaca:

  i. Closed by the cloacal membrane.



Original picture by Prof. Dr. George F.B. Hanna

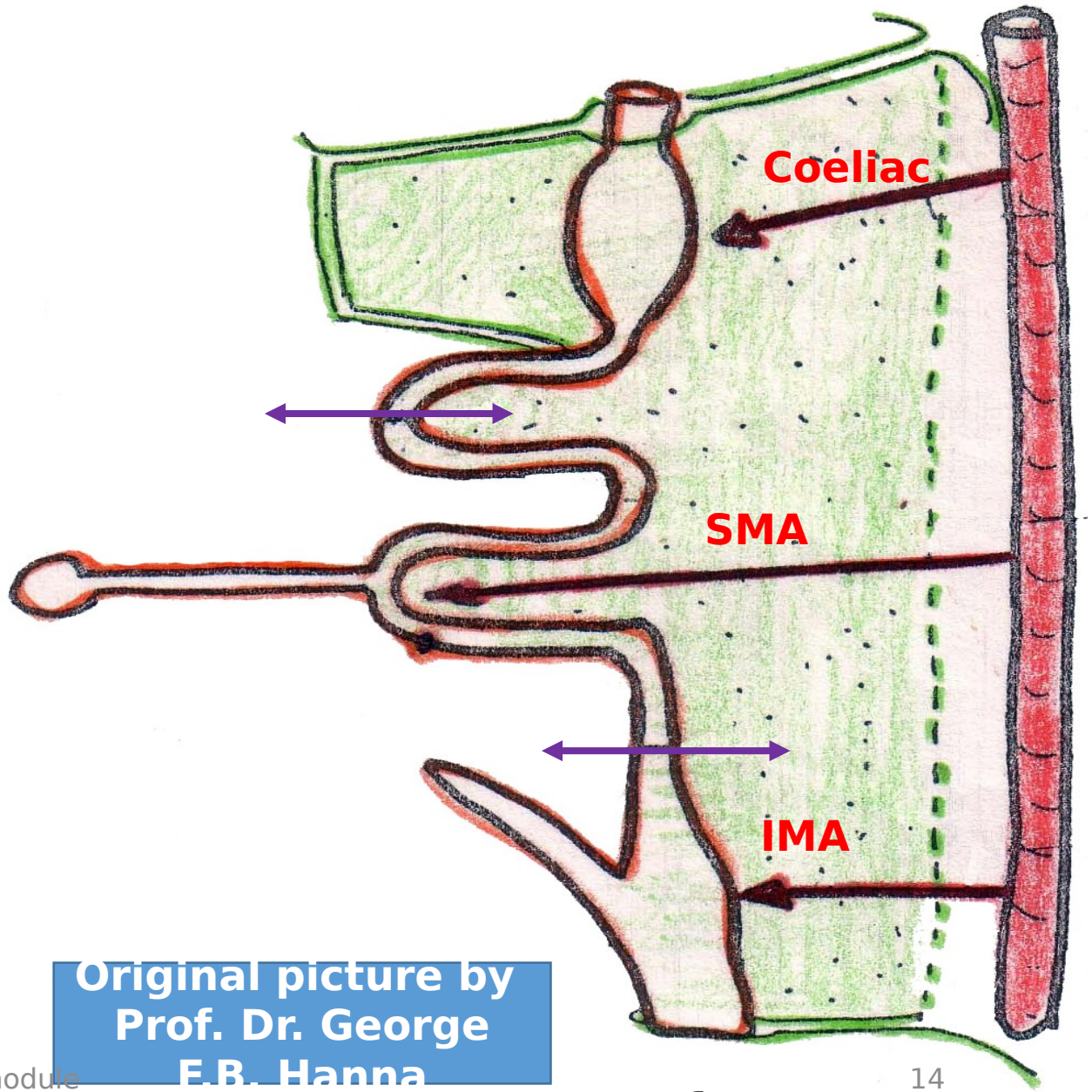
Prof. Dr. George F.B.

- **The whole abdominal part of the gut tube is connected to the post. abdominal wall by Dorsal mesentry through which pass the As. of the gut:**

  a. Coeliac trunk passes in that part of dorsal mesentry connected to the foregut.

  b. Sup. Mesentric A. (SMA) passes in that part of dorsal mesentry connected to the midgut.

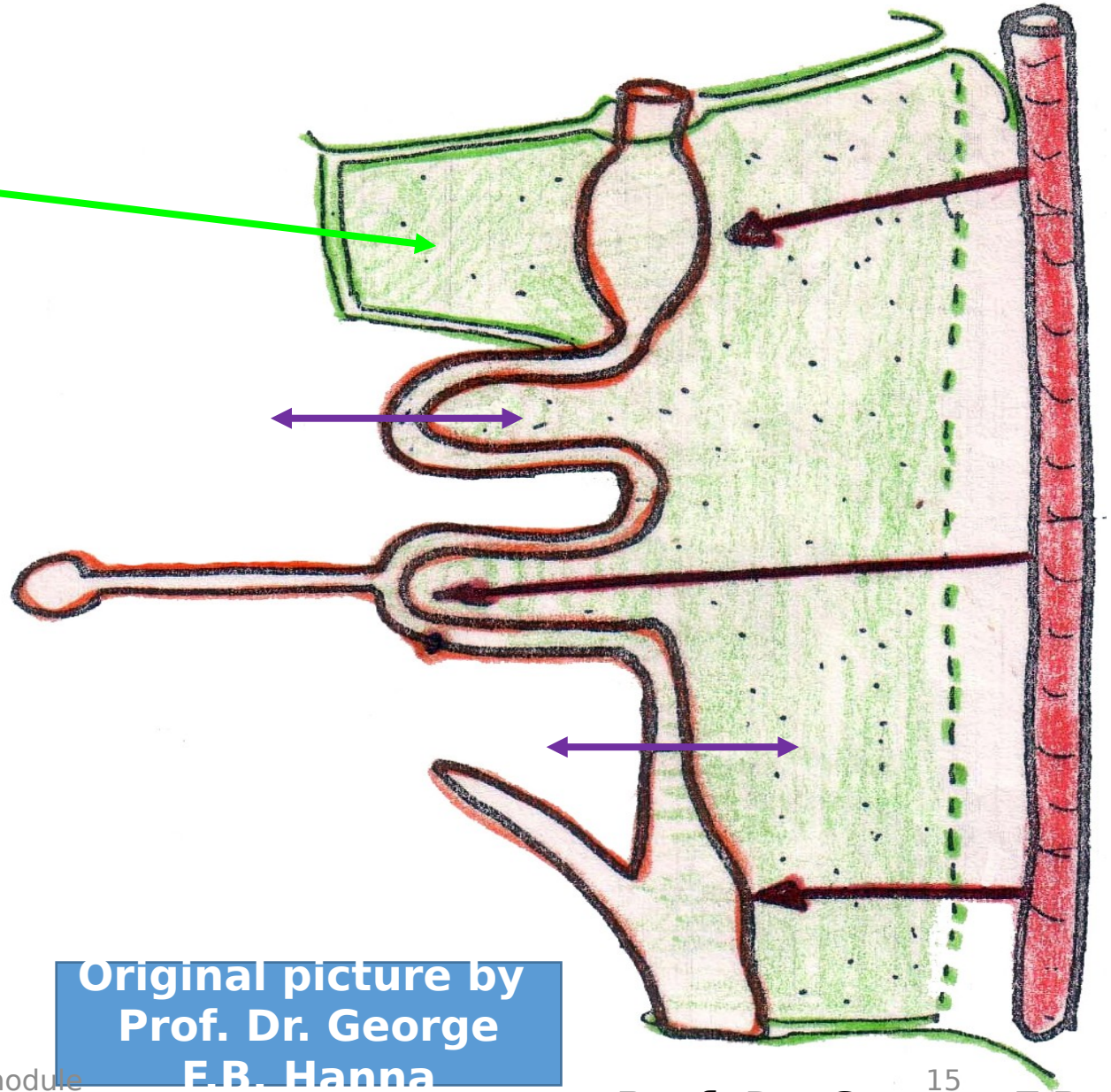
  c. Inf. Mesentric A. (IMA) passes in that



Original picture by Prof. Dr. George F.B. Hanna

Prof. Dr. George F.B.

- **A ventral mesentry (= ventral mesogastrium) is found <u>only</u> in the region of the fusiform dilatation (= Stomach) & proximal 1” of the duodenal loop.**

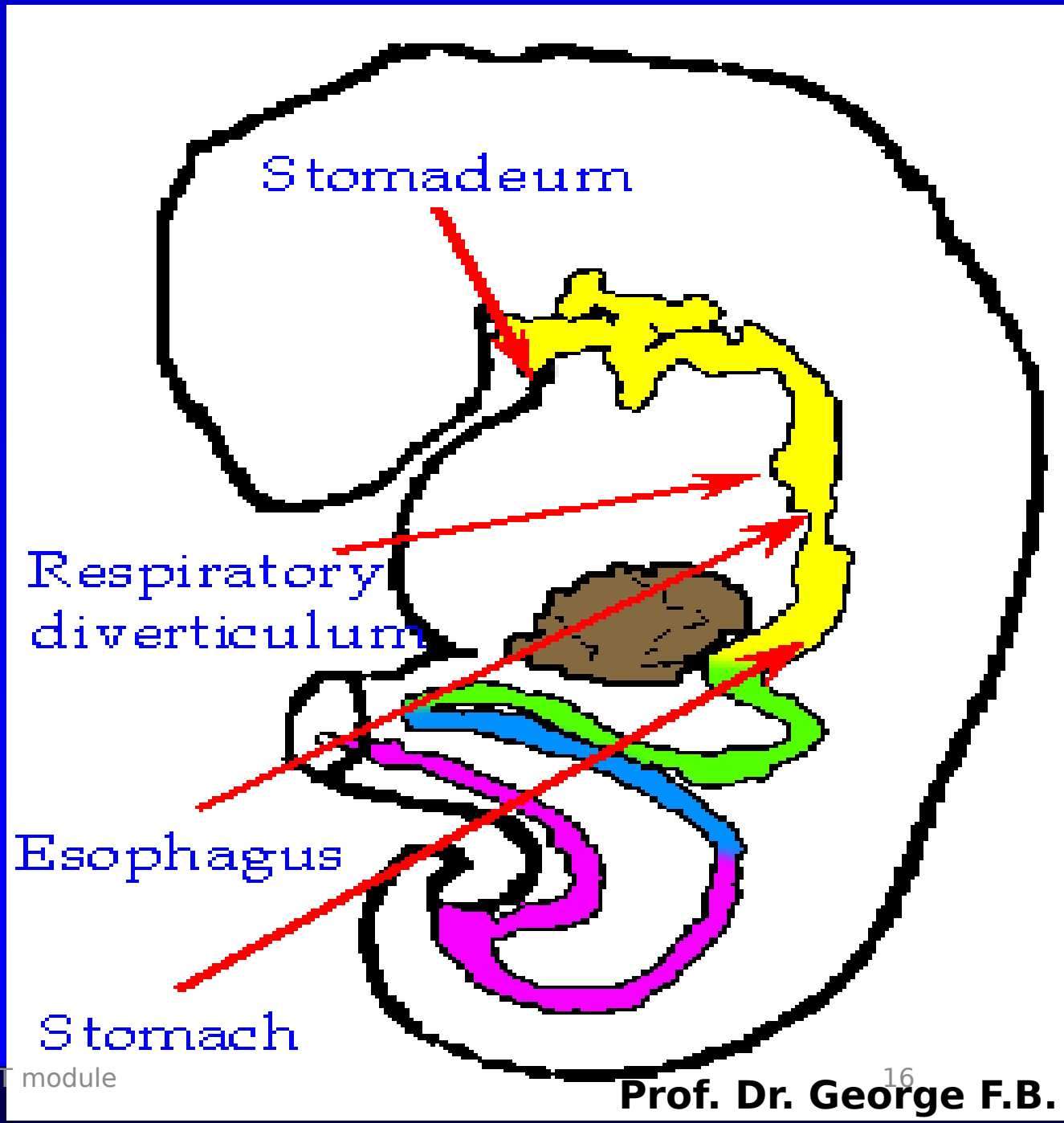


Original picture by Prof. Dr. George F.B. Hanna

Prof. Dr. George F.B.

Development of the Foregut

- Foregut gives rise to:
  - esophagus
  - stomach
  - duodenum
  - liver
  - pancreas
  - respiratory system (larynx to alveoli)



Prof. Dr. George F.B.

Lecture Quiz

The midgut is connected to the definitive yolk sac by:

a. Dorsal mesentry.
b. Vitello- intestinal duct.
c. Superior mesentric artery.
d. Allantois.
e. Cloaca.

Lecture Quiz Answer

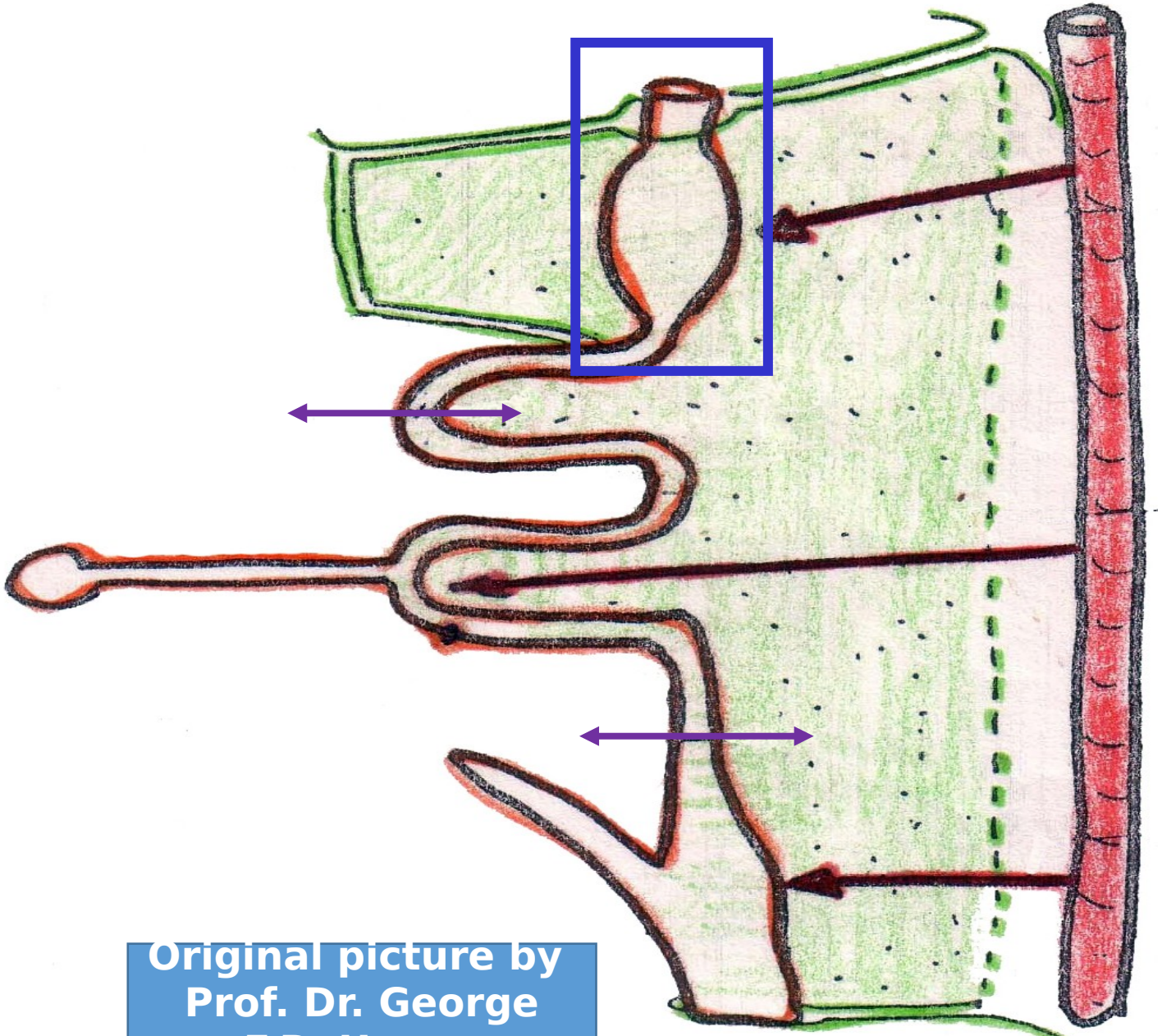
The midgut is connected to the definitive yolk sac by:

a. Dorsal mesentry.
b. Vitello- intestinal duct.
c. Superior mesentric artery.
d. Allantois.
e. Cloaca.


ANY
QUESTIONS
?

Stomach

- **Stomach develops from the fusiform dilatation of the foregut.**



Original picture by Prof. Dr. George F.B. Hanna

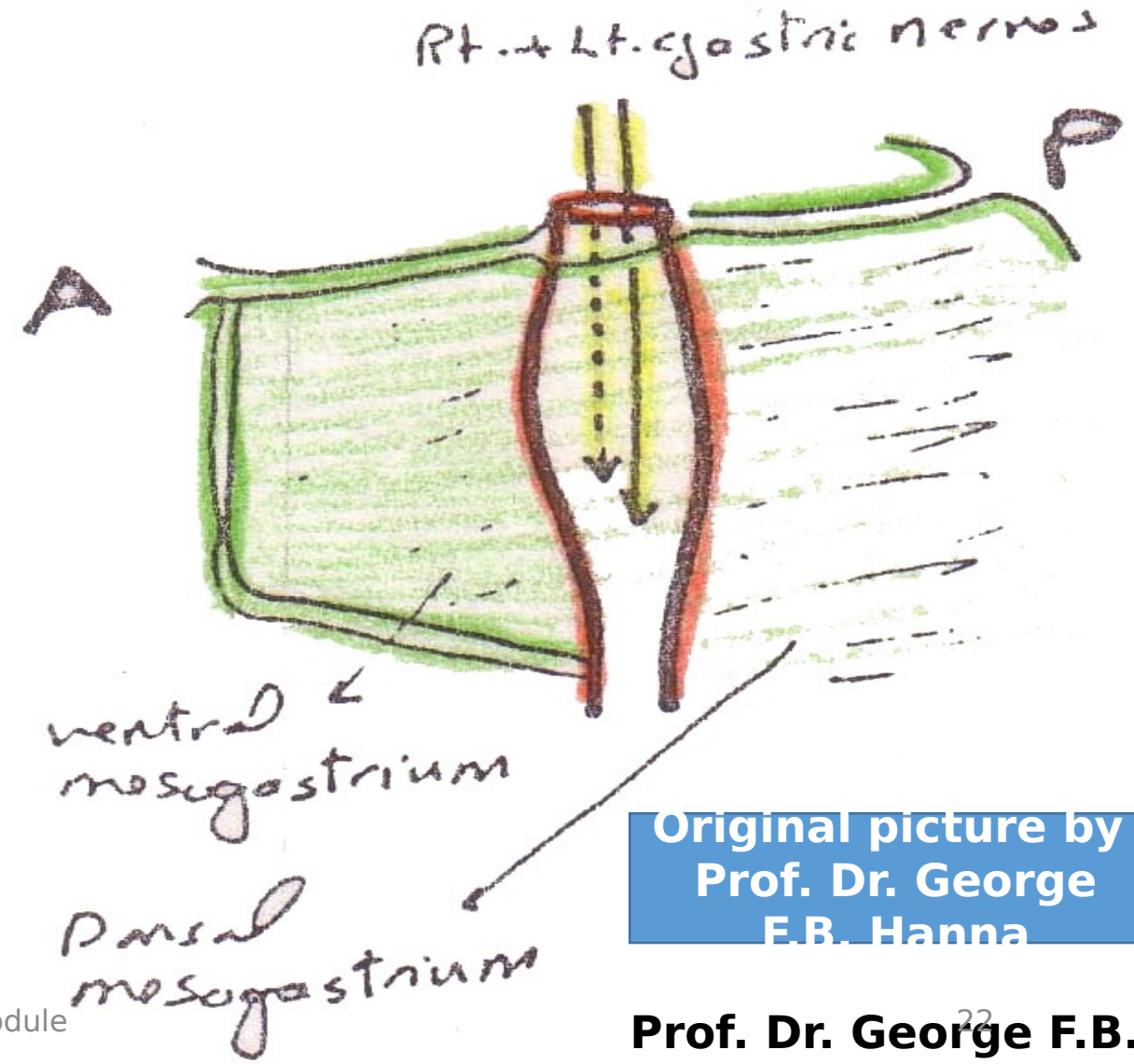
Prof. Dr. George F.B.

- **This primitive fusiform stage has**

a. **An ant. border connected by a ventral mesogastrium (ventral mesentry) to the ant. abdominal wall.**

b. **A post. border connected by a dorsal mesogastrium (dorsal mesentry) to the post. abdominal wall, bet. the 2 layers of which passes the coeliac trunk.**

c. **2 surfaces (Rt. & Lt.) with the Rt. & Lt. vagus**

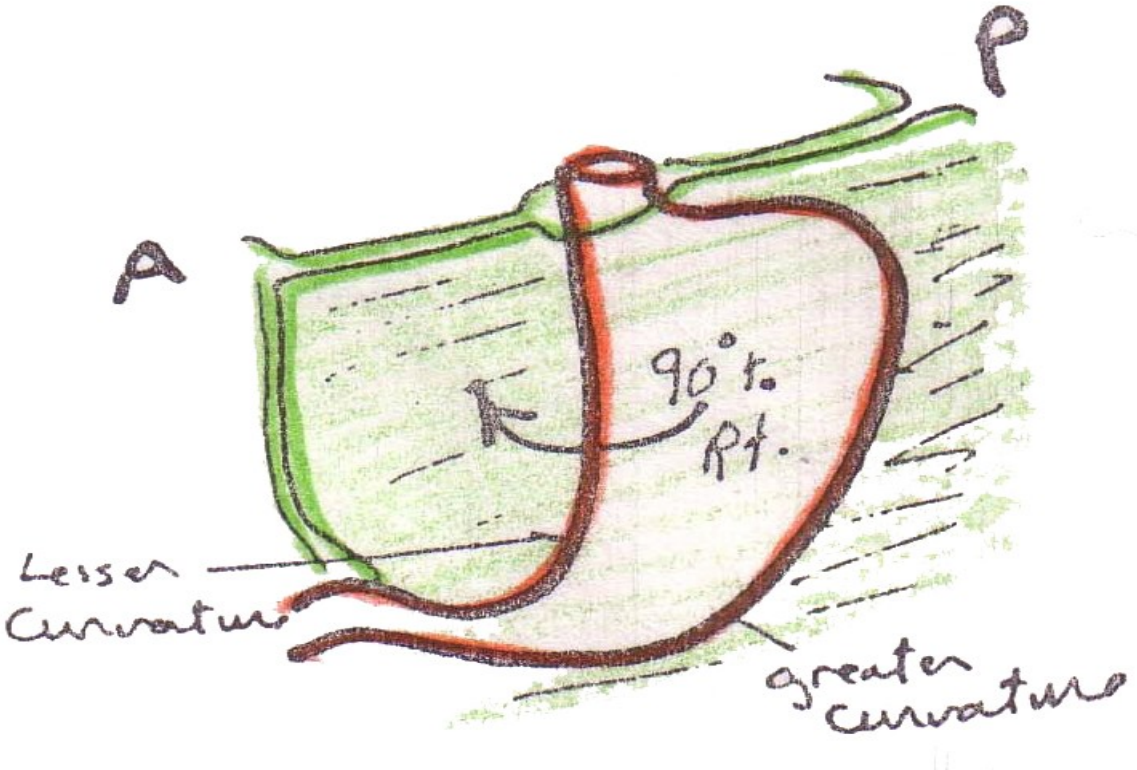


Original picture by Prof. Dr. George F.B. Hanna

Prof. Dr. George F.B. Hanna

What happens ?

- **The post. border expands more than the ant. one → formation of greater & lesser curvatures of the stomach → "stretch" of the dorsal mesogastrium as well.**
- **The stomach is pushed to the Lt. side (by the**



Original picture by Prof. Dr. George F.B. Hanna

Prof. Dr. George F.B. Hanna

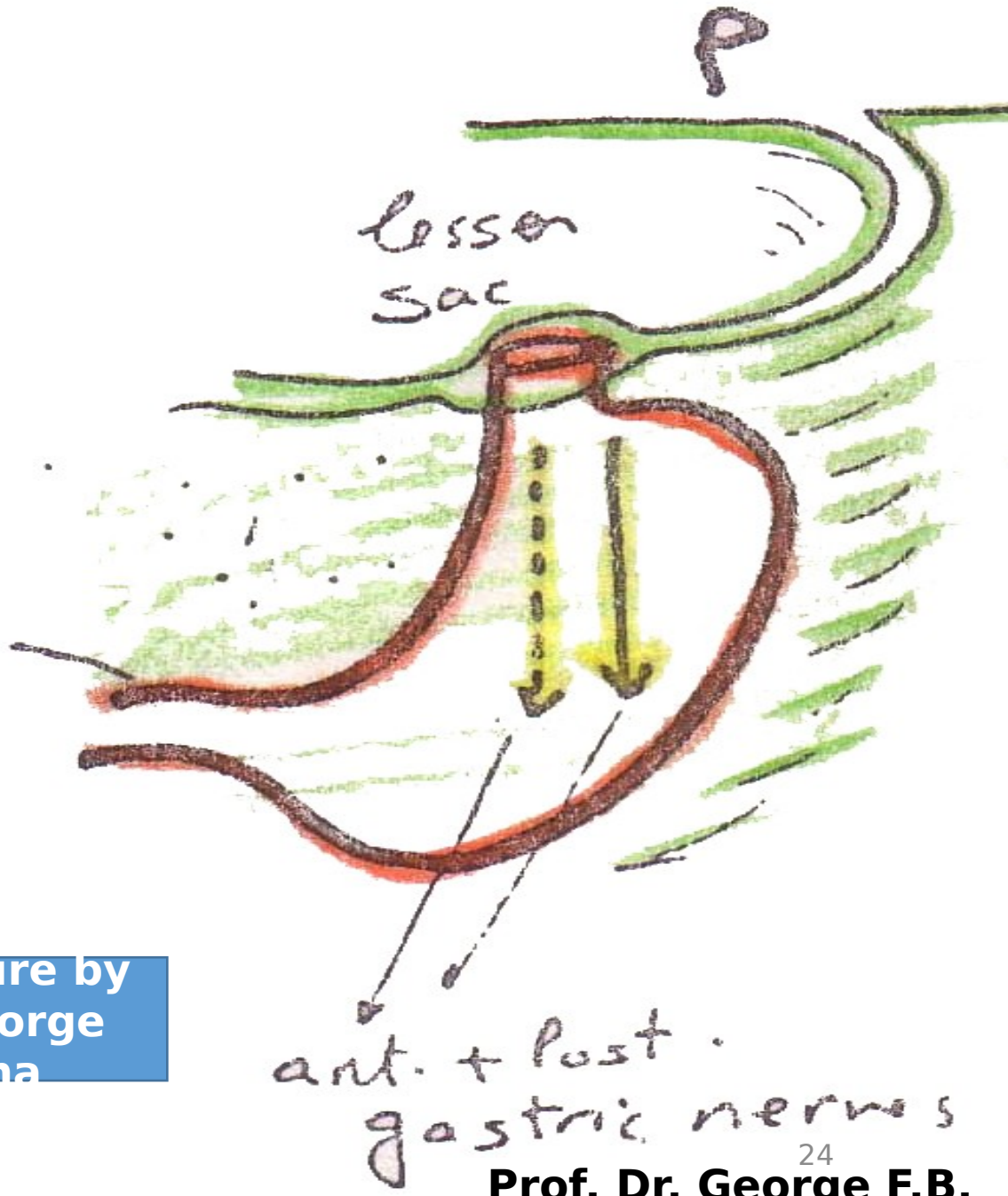
Results of the 90° rotation of the stomach to the Rt. Side:

1- The **Lt. surface** is now ant.

2- The **Lt. vagus N.** is now ant. gastric N.

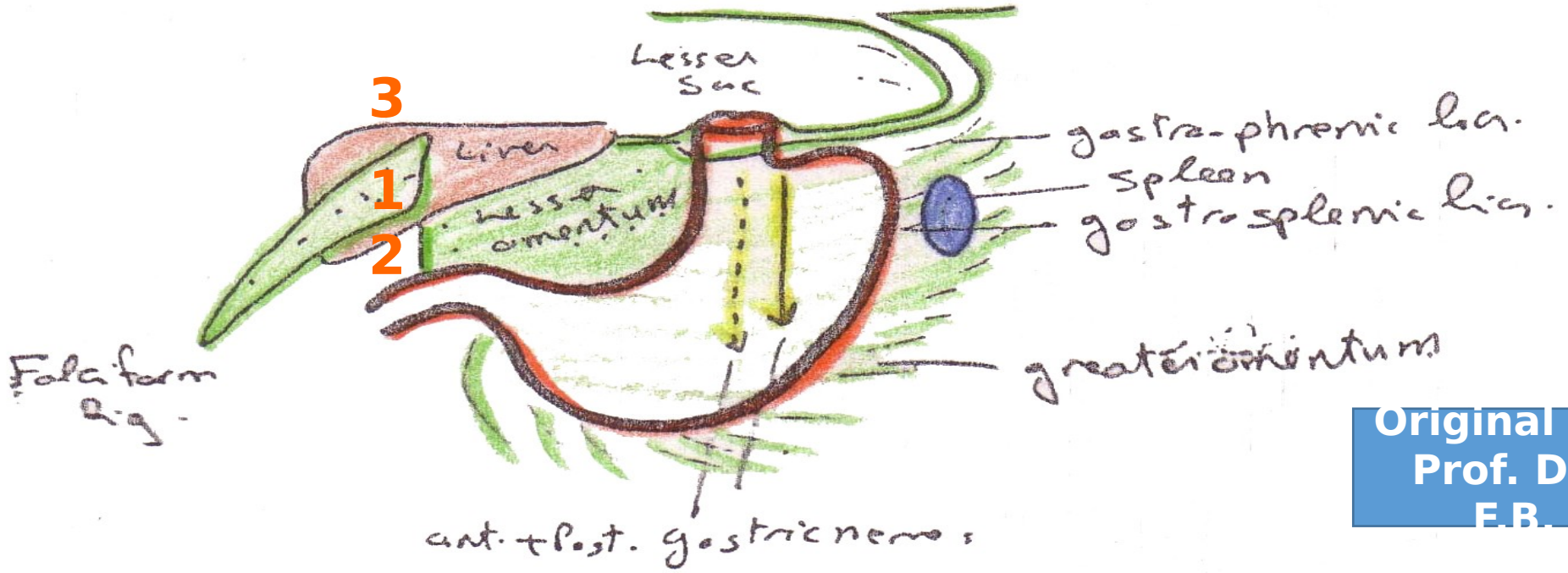
3- The **ant. border** is now the lesser curvature directed to the Rt.

4- **A small recess of peritoneum (= Lesser sac)** is found behind the stomach.



Original picture by Prof. Dr. George F.B. Hanna

Derivatives of the Ventral Mesogastriu



Original picture by Prof. Dr. George F.B. Hanna

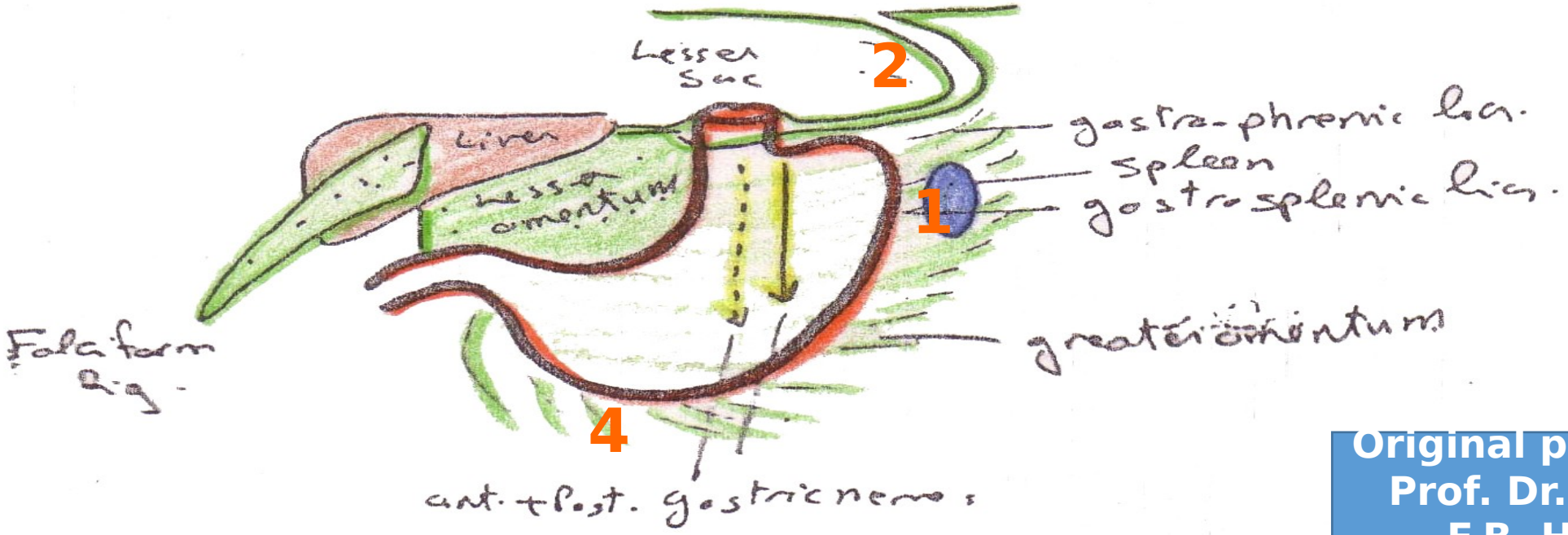
It is divided by the growing liver into:

1- Ant. part bet. Liver & AAW = Falciform lig.

2- Post part bet. Liver & stomach = Lesser omentum.

3- Sup. part bet. Liver & diaphragm = Coronary & Triangular ligs.

Derivatives of the Dorsal Mesogastrium



Original picture by Prof. Dr. George F.B. Hanna

- **It is divided by the growing spleen into:**

1- Ant. part bet. Spleen & stomach = Gastrosplenic lig.

2- Post. part bet. Spleen & post. abdomial wall where the kidney was developing = Leinorenal lig.

3- Sup. part bet. Stomach & diaphragm = Gastrophrenic lig.

4- Inf. "stretched" part = Greater omentum.

Prof. Dr. George F.B. Hanna

Lecture Quiz

Which of the following is a derivative of the dorsal mesogastrium?

a. Falciform ligament.
b. Coronary ligament.
c. Greater omentum.
d. Lesser omentum.
e. Transverse mesocolon.

Lecture Quiz Answer

Which of the following is a derivative of the dorsal mesogastrium?

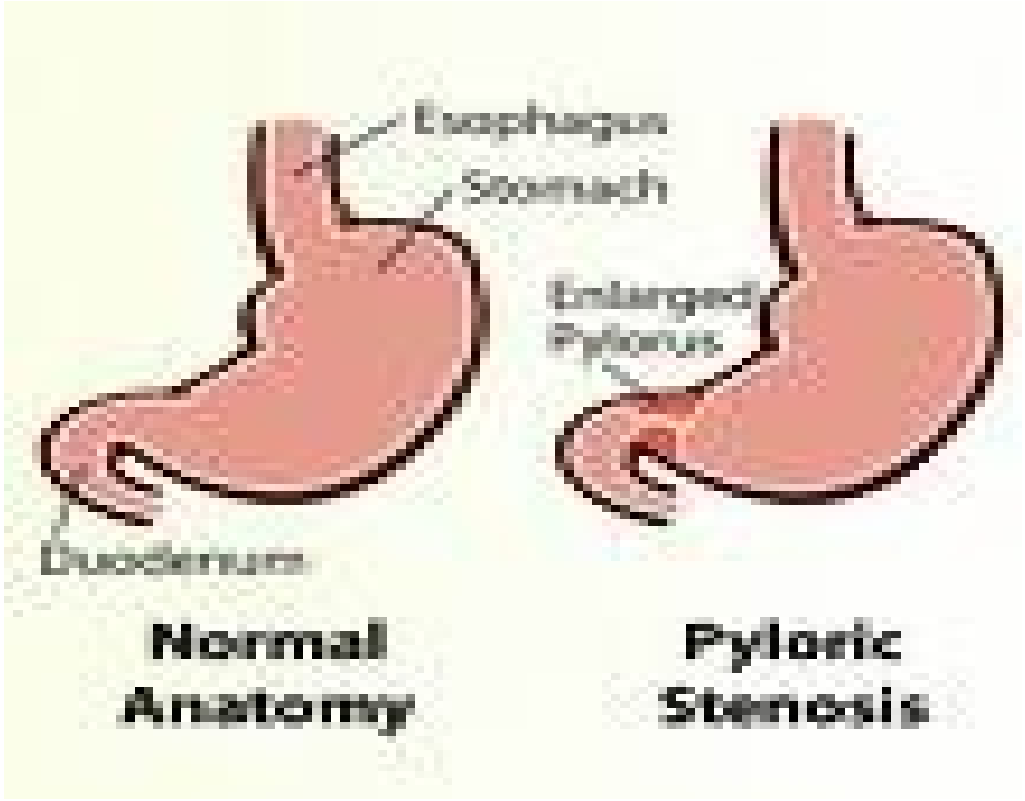
a. Falciform ligament.
b. Coronary ligament.
c. Greater omentum.
d. Lesser omentum.
e. Transverse mesocolon.


ANY
QUESTIONS
?

Anomalies of stomach

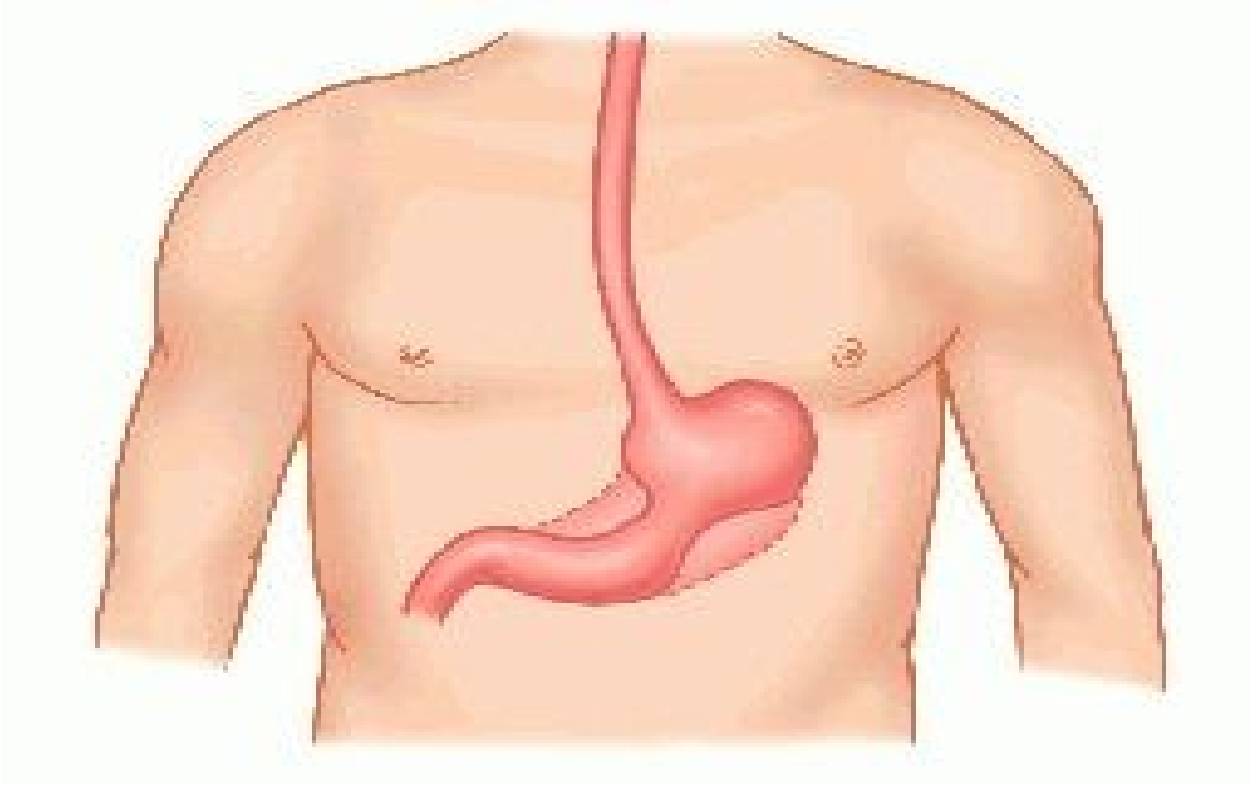
1) Congenital pyloric stenosis.
2) Hour glass stomach.
3) Transposition of stomach (Rt. Sided stomach).
4) Achalasia of the cardia.

Anomalies

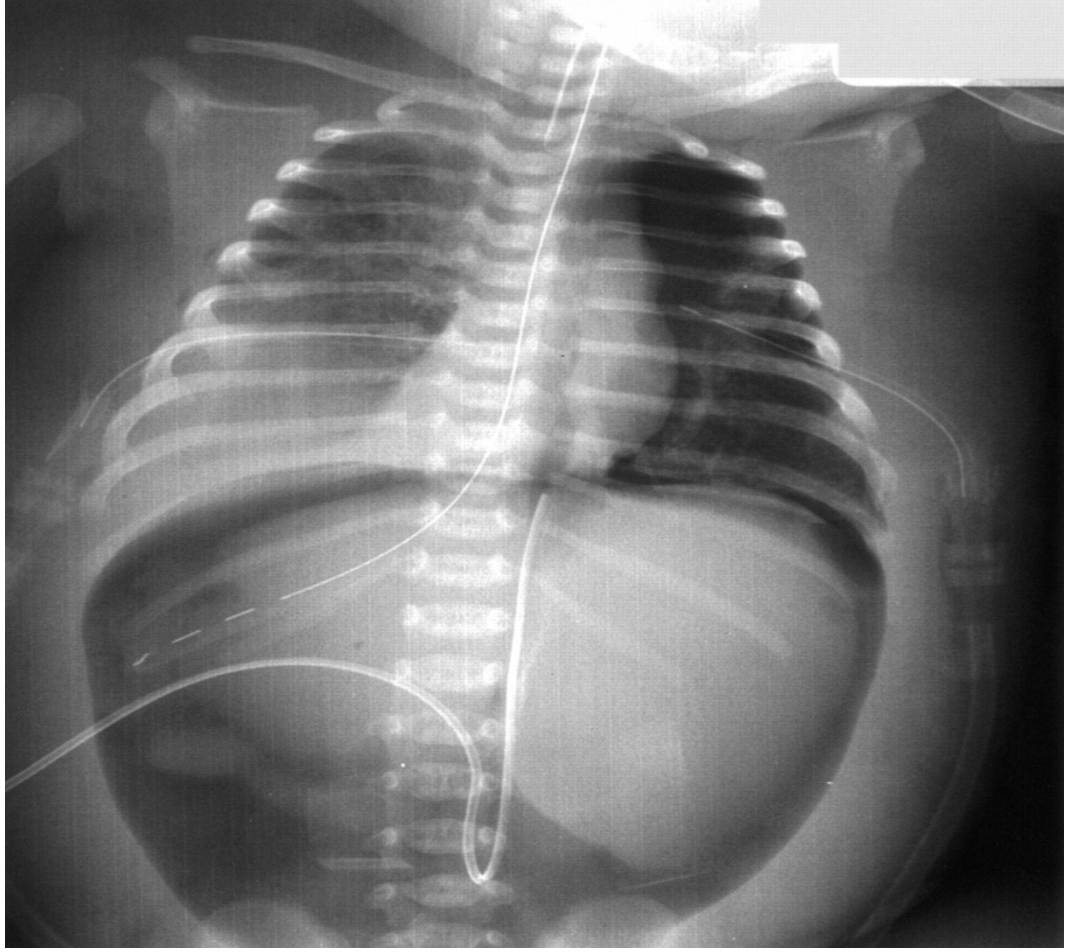


1- Congenital pyloric stenosis

due to thick pyloric sphincter → stenosis



2- Hour glass stomach
(with a constricted middle part)



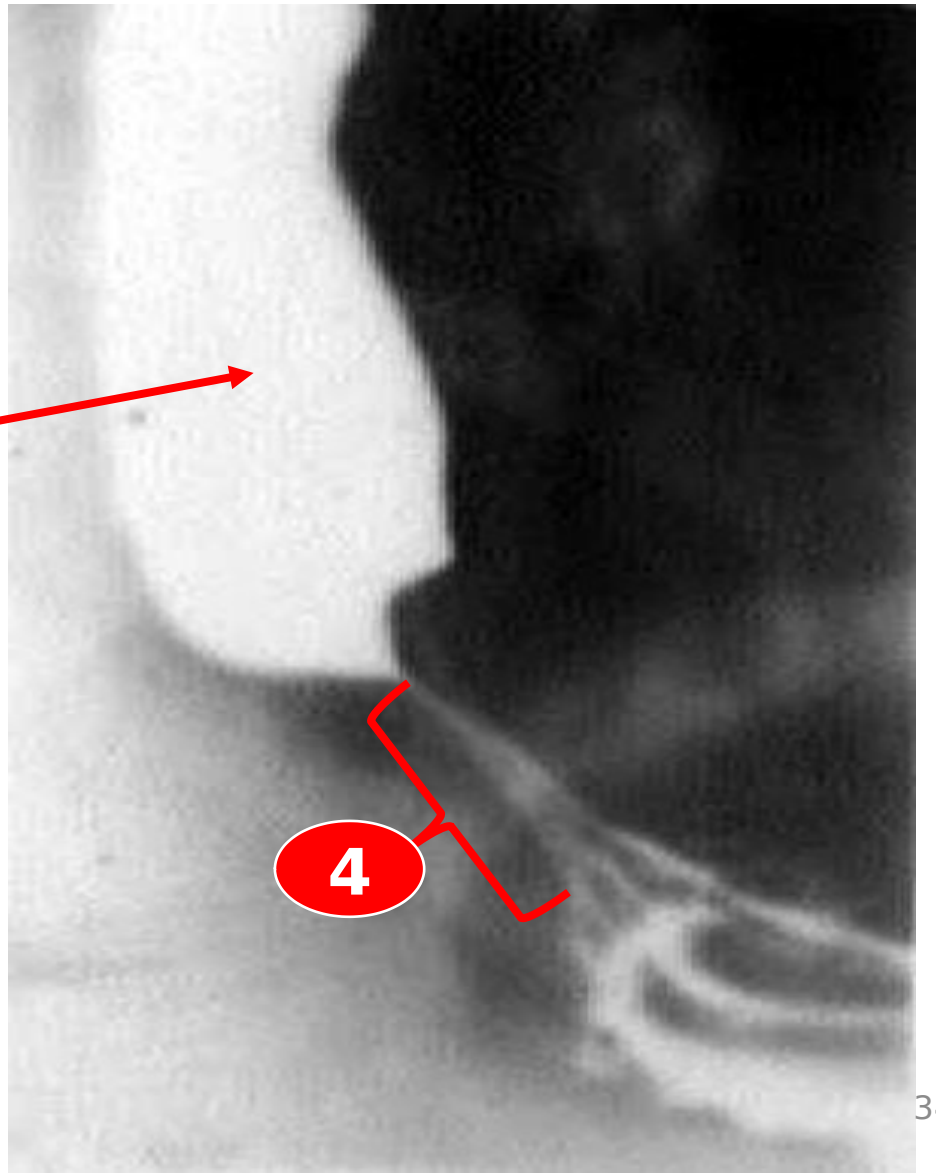
3- Transposition of stomach (Rt. sided stomach)

@ Due to reversed rotation.

@ It may occur alone, or as a part of situs inversus totalis.

4- Achalasia of the cardia

- **Due to failure of the cardiac sphincter to open in deglutition (due to neuro-muscular disharmony).**
- **Leading to dilatation of the oesophagus.**



ثلاثة عبارات للحصول لتحقيق النجاح:

- كن أعلم من غيرك
- أعمل أكثر من الآخرين
- توقع أقل مما يحصل عليه الآخرون

ويليم شكسبير

Duodenum

Duodenum

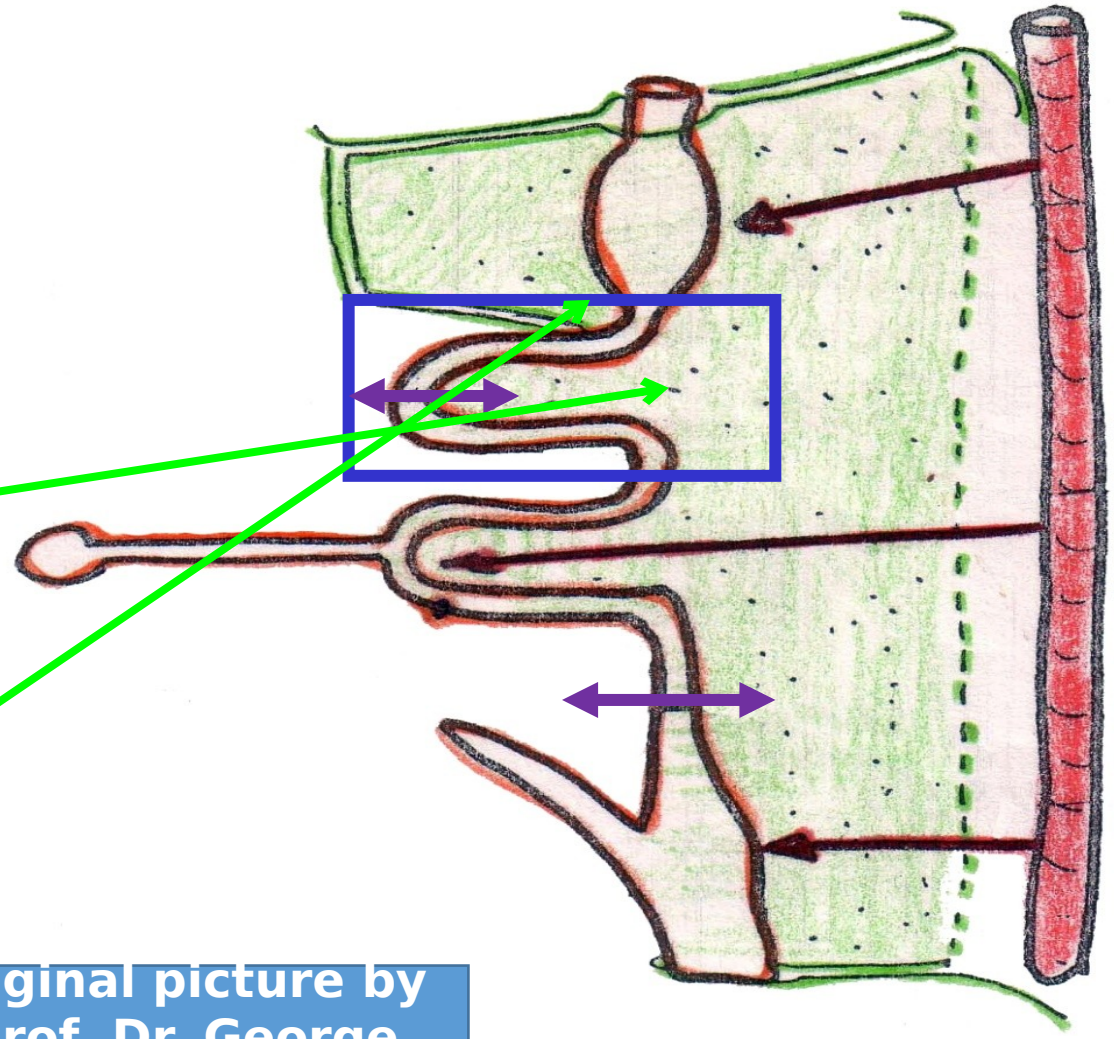
- **It develops from the duodenal loop:**

1- Its upper part belongs to the foregut.

2- Its lower part belong to the midgut.

3- It is connected to the post. abdominal wall by the mesoduodenum.

4- Only its proximal 1” is connected to the ant. abdominal wall by the ventral mesogastrium (=

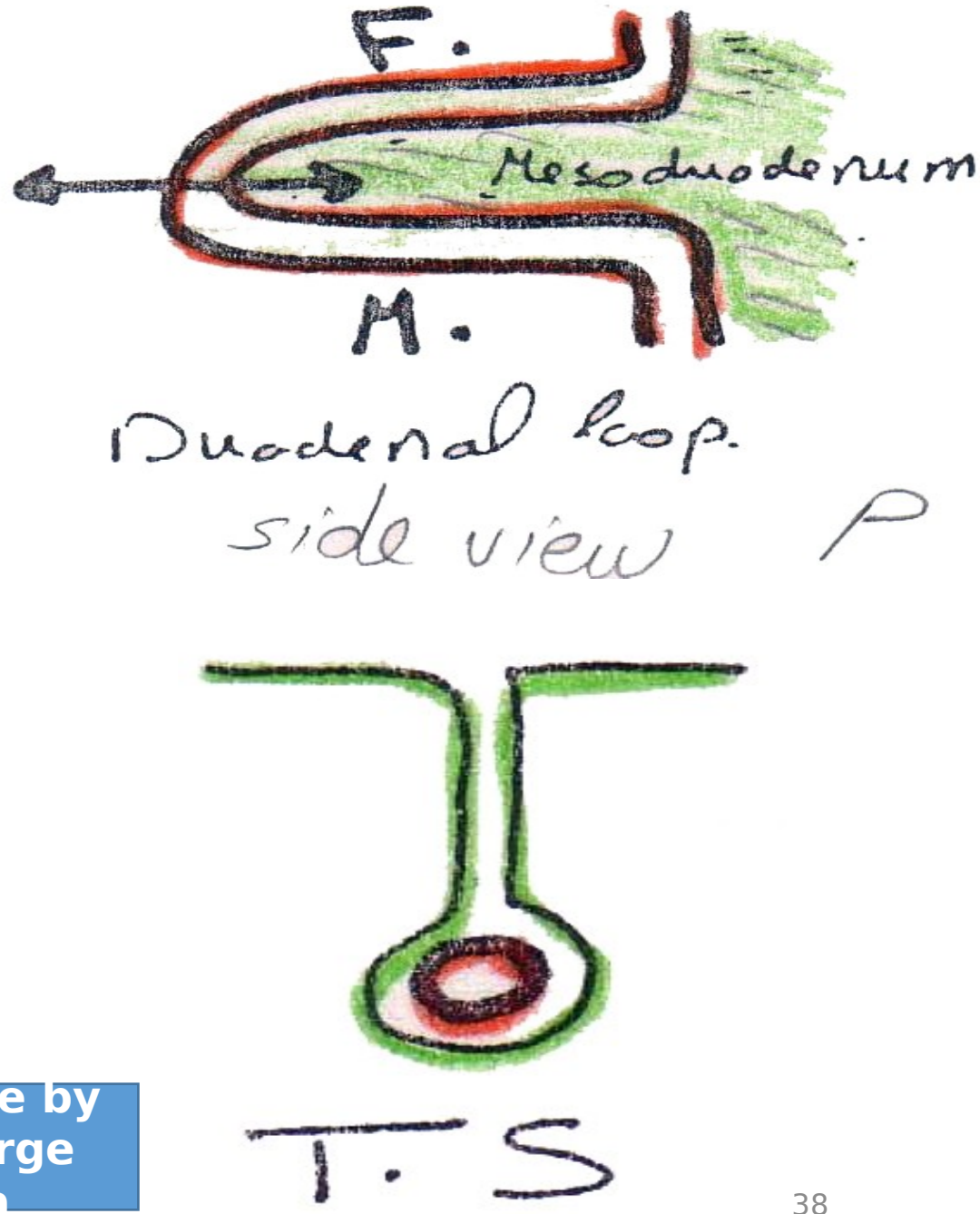


Original picture by Prof. Dr. George F.B. Hanna

Prof. Dr. George F.B.

Arterial Supply reflects the developmental origin

- The upper ½ is derived from foregut, therefore supplied by coeliac trunk (sup. panc. duod. A.).
- The lower ½ is derived from midgut, therefore supplied by SMA (inf. panc. duod. A).



Original picture by Prof. Dr. George F.B. Hanna

Prof. Dr. George F.B.

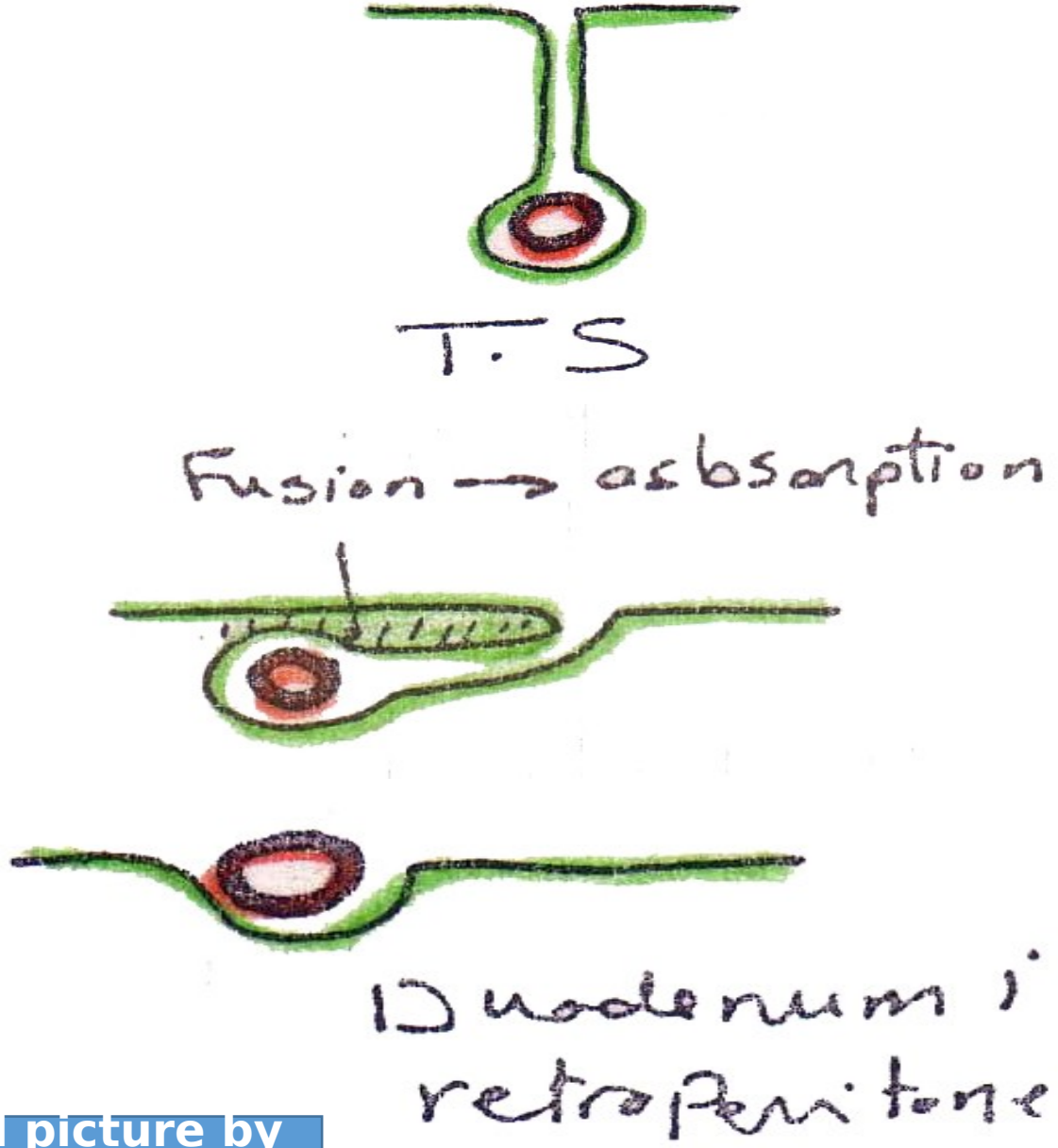
What happens ?

- **The duodenal loop rotates 90° to the Rt. Side with the stomach**
- **With the exception of the first inch, the rest of the duodenum:**

1- Now rests post. on 2 layers of peritoneum (will be fused & absorbed), while

2- Covered ant. by 1 layer of peritoneum (persists)

3- Therefore the duodenum becomoes retro-peritoneal.



Original picture by Prof. Dr. George F.B. Hanna

Prof. Dr. George F.B. Hanna

Lecture Quiz

One of the following anomalies of the stomach occurs due to neuro-muscular disharmony:

A. Congenital pyloric stenosis.
B. Hour glass stomach.
C. Transposition of stomach (Rt. Sided stomach).
D. Achalasia of the cardia.

Lecture Quiz Answer

One of the following anomalies of the stomach occurs due to neuro-muscular disharmony:

A. Congenital pyloric stenosis.
B. Hour glass stomach.
C. Transposition of stomach (Rt. Sided stomach).
D. Achalasia of the cardia.

SUGGESTED TEXTBOOKS

Langman's Medical Embryology,9th edition, Chapter

13 , p. 285-289; 292-298.

Thank You

Prof. Dr. George F.B. Hanna